

### REMARKS

New Claim 17 finds support on page 1, lines 20 to 23.

Claims 12 and 16 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Applicants traverse this rejection.

The Office Action stated: that Claims 12 and 16 recite the limitation “an organic solvent” in line 2 of each claim; and that there is insufficient antecedent basis for this limitation in the claim. This statement is incorrect. The phrase “an organic solvent” uses the article “an” so it does not require antecedent basis.

This rejection should be withdrawn.

Claims 7 to 16 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Bulls et al. (WO 9212962). Applicants traverse this rejection.

Under the heading “Determination of the scope and content of the prior art (M.P.E.P. §2141.01)” the Office Action stated that applicants claim a process for preparing a cyanoacetic acid ester of formula (I) which comprises oxidizing an alkoxypropionitrile of formula (II) using oxygen or an oxygen-forming reagent in the presence of a catalyst based on lead or one of the transition metals. Applicants disagree with this statement because it does not include formulae (I) and (II). The formulae readily show applicants’ one-step process of converting the alkoxypropionitrile to the cyanoacetic acid ester.

Applicants' claimed invention is the process for the preparation of a cyanoacetic acid ester of the formula:



in which R is an optionally substituted linear or branched C<sub>1-8</sub>-alkyl group or an aryl-C<sub>1-4</sub>-alkyl group, comprising oxidizing an alkoxypropionitrile of the formula:



in which R has the meaning given above, using oxygen or an oxygen-forming reagent to give the cyanoacetic acid ester of formula I, in the presence of a catalyst based on lead or one of the transition metals. Applicants' invention involves a one-step preparation process, not a two-step preparation process.

Bulls et al. does not teach or suggest applicants' one-step preparation process, and only teaches a two-step process. A two-step process does not teach or suggest a one-step process. Applicants' one-step process has substantial advantages over the two-step process of Bulls et al.

Applicants' specification states:

"WO 92/01296 [Bulls et al.] describes the oxidation of partially oxidized propionitriles (e.g. cyanoacetaldehyde or acetals thereof) by means of oxygen or other oxidants in the presence of catalysts such as

iron chloride or palladium chloride, cyanoacetic acid likewise being formed first, which then has to be converted into a cyanoacetic acid ester by acid-catalysed esterification with the appropriate alcohol."

"The object of the present invention is to make available a process for the preparation of cyanoacetic acid esters in which the desired cyanoacetic acid esters are formed directly." [Emphasis supplied] [Page 1, line 33, to page 2, line 6]

The Examiner has not even provided a prima facie showing of obviousness in the record.

The Office Action stated that Bulls et al. discloses the preparation of cyanoacetic acid esters by oxidizing a partially-oxidized propionitrile of formula (I) using for example oxygen, in the presence of transition metal catalysts such as Pd. This statement is clearly an incorrect statement of the two-step process and disclosure of Bulls et al. Bulls et al. produces cyanoacetic acid in a first step by oxidizing a partially-oxidized propionitrile and then esterifies the cyanoacetic acid to produce the cyanoacetic acid ester. The information clearly shows that the Examiner has not factually established a prima facie showing of obviousness in the record.

The Office Action stated see the Abstract, page 1, lines 1 to 13, page 3, lines 1 to 22, page 4, lines 3 to 30, page 5, lines 2 to 25, page 6, the last paragraph, page 15, Example 23, page 19, Example 29, page 25, and Example 33, page 26, lines 1 to 14 [of Bulls et al.]. These portions of Bulls et al. do not

support the Examiner's position. Instead, these portions of Bulls et al. show that Bulls et al. only discloses a two-step preparation process. The following are from the portions of Bulls et al. cited by the Examiner:

"This is a process for preparing cyanoacetic acid (CAA) or its esters by further oxidizing a partially oxidized propionitrile compound \*\*\*.\*\*\*

The partially oxidized propionitrile compound is preferably produced from acrylonitrile. An optional step is the esterification of the cyanoacetic acid."

[Emphasis supplied] [Abstract]

"This is a process for preparing cyanoacetic acid (CAA) or its esters by further oxidizing a partially oxidized propionitrile compound \*\*\*.

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The partially oxidized propionitrile compound is preferably produced from acrylonitrile. An optional step is the esterification of the cyanoacetic acid."

[Emphasis supplied] [Page 1, lines 2 to 13]

"None of the prior art shows the oxidation of the listed partially oxidized propionitrile compounds to directly produce CAA. The prior art similarly does not show the combination of the [sic.] step with either the esterification of the CAA to its ester or the production of the listed partially oxidized propionitrile compounds from ACN."

"Summary of the Invention"

"This is a process for preparing cyanoacetic acid (CAA) or its esters by further oxidizing a partially oxidized propionitrile compound \*\*\*.

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An optional step is the esterification of the product cyanoacetic acid.”

[Emphasis supplied] [Page 3, line 12, to page 4, line 8]

“Description of the Invention”

“This is a process for preparing cyanoacetic acid (CAA) (or its esters) by further oxidizing a partially oxidized propionitrile compound \*\*\*.

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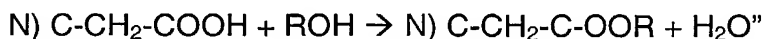
Additionally, the inventive process includes the optional steps of :

- a.) producing the partially oxidized propionitrile by oxidizing acetonitrile (ACN), and
- b.) esterifying the product CAA to produce alkylcyanoacetates.”

[Emphasis supplied] [Page 4, lines 17 to 29]

“Conversion of CAA to the corresponding ester”

“CAA is also easily converted to the ester by acid catalyzed hydrolysis using alcohols.



[Emphasis supplied] [Page 5, lines 21 to 24]

“The following examples illustrate the oxidation of CAH to CAA using oxygen as the oxidant.”

[Emphasis supplied] [Page 15, lines 1 and 2]

All of the above portions of Bulls et al. show that Bulls et al. discloses a two-step preparation process.

There is a substantial error in lines 26 to 28 of page 4 in Bull et al., namely, in the following:

“Additionally, the inventive process includes the optional steps of:

- a.) producing the partially oxidized propionitrile by oxidizing acetonitrile (CAN),....” [Emphasis supplied]

Please note that “ACN” is an abbreviation which may be used for both acetonitrile ( $C_2H_3N$ ) and acrylonitrile ( $C_3H_3N$ ). Since it is impossible to obtain a  $C_3$  compound (propionitrile) by mere oxidation of a  $C_2$  compound (acetonitrile), it is obvious to a person of ordinary skill in the art of organic chemistry that in Bulls et al. “ACN” means acrylonitrile ( $C_3H_3N$ ). See also the first reaction scheme on page 3 of Bulls et al. - it clearly depicts the formula of acrylonitrile, not acetonitrile.

In re Yale, 168 USPQ 46, (C.C.P.A. 1970), states:

“It is our opinion that not only is the listing of  $CF_3CF_2CHClBr$  in Clements a typographical error but also this fact would be apparent to one of ordinary skill in the art when reading the Clements article. Since it is an obvious error, it cannot be said that one of ordinary skill in the art would do anything more than mentally disregard  $CF_3CF_2CHClBr$  as a misprint or mentally substitute  $CF_3CHClBr$  in its place. Certainly he would not be led by the typographical error to use the erroneous compound as an anesthetic even if as a chemist of ordinary skill in the art he would know how to prepare the compound. He simply would not get so far in the

thought process as to determine if he knew how to make  $\text{CF}_3\text{CF}_2\text{CHClBr}$ , as it would have long since been discarded by him as an obvious typographical error.” [Pages 48 and 49]

Example 23, cited by the Examiner, converts CAH (i.e., the hydrate of cyanoacetaldehyde) to CAA (i.e., cyanoacetic acid), that is not applicants’ product. Examples 24 and 25 are similar to Example 23 in reaction and result.

Note that Example 27 shows the esterification of CAA with ethanol.

Example 28, shows conversion of CAH to CAA. Examples 30 and 31 show conversion of CAH and CADA to CAA. Example 32 shows conversion of CAH to CAA.

Example 33 was also cited by the Examiner. Bulls et al. states:

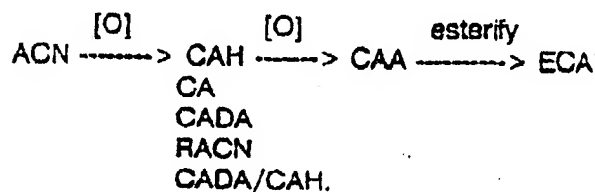
“The following procedure was used in example 33 set out below in which CAH is oxidized to CAA using  $\text{O}_2$ .” [Emphasis supplied]

[Page 24, last two lines]

Like the other examples dealing with nonrelevant conversion of CAH (or CADA) to CAA, Examples 33 only deals with the first step of Bulls et al.’s two-step preparation process.

Bulls et al. itself quite clearly defines its invention as a two-step preparation process (with the optional preliminary step of preparing the starting material). At the end of Bulls et al.’s “Summary of the Invention”, Bulls et al. states:

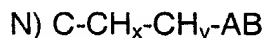
"This overall reaction scheme is outlined as follows:



[Emphasis supplied] [Page 4, lines 8 to 15]

Independent Claim 1 of Bulls et al. sets out the first step:

"A process for producing cyanoacetic acid by further oxidizing a partially oxidized propionitrile compound of the following formula:



where A is H-, -OH, or -OR; and B is -OH, -OR, or =O; x=1 or 2, y=0 or 1 (depending upon the selection of A and B); but where B is =O, A is -H, and x=0; and where y=1, x=0, and B is not =O."

[Emphasis supplied]

Dependent Claim 2 of Bulls et al. sets out the second step:

"The process of claim 1 including the step esterifying the product cyanoacetic acid." [Emphasis supplied]

Claim 1 of Bulls et al. is not only somewhat cryptic, it also contains several mistakes. The (corrected) general formula in Bulls et al. is  $\text{N}\equiv\text{C-CH}_x\text{-CH}_y\text{AB}$



(note the triple bond and that there are no hyphens other than that between the cyano group and the attached carbon, because there may be single or double bonds while a hyphen denotes a single bond only). The provisos make no sense at all, because  $x$  cannot be 0. What was apparently intended with the first proviso is the following: If  $B$  is  $=O$ ,  $A$  must be  $-H$  (otherwise the compound would already be an acid or ester!) and  $y$  must be 0 because carbon is tetravalent. Thus, the formula becomes  $N\equiv C-CH_x-CH=O$  and, consequently,  $x$  must be 2. In the second proviso,  $x$  and  $y$  are mixed up; it should read “where  $x=1$ ,  $y=0$ , and  $B$  is not  $=O$ ”. The resulting compounds are  $N\equiv C-CH=CHOH$  (which is merely the enol form of cyanoacetaldehyde),  $N\equiv C-CH=CHOR$  (alkoxyacrylonitrile; cf. page 2, last sentence, of Bulls et al.),  $N\equiv C-CH=C(OH)_2$  and  $N\equiv C-CH=C(OR)_2$  (cf. page 5 of Bulls et al.). The formula of the alkoxypropionitriles (II) of the present application is  $N\equiv C-CH_2-CH_2OR$ , i.e.,  $x=2$ ,  $y=1$ ,  $A=H$ ,  $B=-OR$ . Although these compounds are embraced by the formula of Bulls et al., they are nowhere mentioned in that document. Since the only way to produce the “partially oxidized propionitrile compounds” that Bulls et al. discloses is the oxidation of acrylonitrile, it is clear to a person skilled in the art that Bulls et al. does not envisage alkoxypropionitriles as possible starting compounds for its process because alkoxypropionitriles cannot be prepared by *oxidizing* acrylonitrile. (They can be prepared by *addition* of alcohols to acrylonitrile which is not an oxidation.) Note that all “partially oxidized propionitrile compounds” of Bulls et al. have the same state of oxidation, namely, they are cyanoacetaldehyde or derivatives

(hydrates, acetals, enol ethers) thereof. The starting materials of the present invention are derivatives of cyanoethanol, i.e., an *alcohol*, which has another oxidation state.

Bull et al. is not very relevant to applicants' claimed process.

The Office Action stated that the factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level or ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

The Examiner did not make all of the factual inquiries so this obviousness is fatally defective on its face and, consequently, no prima facie showing of obviousness has been established.

Under the heading "Ascertainment of the difference between the prior art and the claims (M.P.E.P. §2141.02)", the Office Action stated that the prior art process of preparing cyanoacetic acid esters differs from the instant process in that in the presence of a variety of oxidation catalysts such as PdCl<sub>2</sub>/CuCl<sub>2</sub>, FeCl<sub>3</sub> or platinum group metals, a partially oxidized propionitrile is further oxidized to a cyanoacetic ester, wherein the instant process requires alkoxypropionitrile such as 3-methoxypropionitrile to be oxidized to the cyanoacetic acid ester. This statement is an incorrect description of the disclosure of Bulls et al. Applicants

use a one-step preparation, whereas Bulls et al. uses a two-step preparation process. As a result, Bulls et al. directs one ordinarily skilled in the art away from applicants' claimed process and makes applicants' claimed process unobvious to one ordinarily skilled in the art.

Catalytic activity is unpredictable. Transfer of catalytic activity from one process to another process is accordingly unpredictable. Neither of the two steps of Bull et al. corresponds to applicants' single step so the catalytic effect of the catalysts in either or both of Bulls et al.'s process steps is unpredictable as regards applicants' single step. The Examiner has indulged in forbidden hindsight.

Manganese and cobalt are transition metals. Applicants found that cobalt catalyst are the preferred catalysts for the oxidation of the  $-CH_2OR$  to  $-COOR$ . Applicants list water as solvent. However, page 26, lines 9 and 10, of Bulls et al. states that, in the step of seeking oxidation of CAH to CAA, the use of either manganese or cobalt, in water, led to the complete oxidation of CAH. Thus, manganese and cobalt catalysts were failures in Bulls et al.'s first step whereas manganese and cobalt were successful in applicants' single step process. Bulls et al. provides proof of the unpredictability of catalytic activity in this area of chemistry and shows the unobviousness of applicants' single-step process.

The Office Action stated that the use of alkoxypropionitrile in the presence of a transition metal catalyst is prima facie obvious in view of the disclosure by Bulls et al. because transition metals embrace derivatives of Pd, Cu or platinum

group metals. Applicants traverse this statement as being mere speculation that is factually unsupported in the record. Bulls et al. (see page 5) uses a transition metal catalyst in the oxidation of  $\text{NC-CH}_2\text{-CH(OH)}_2$  or  $\text{NC-CH=CH-OH}$  to  $\text{NC-CH}_2\text{-COOH}$ , or in the oxidation of  $\text{NC-CH}_2\text{-CH(OR)}_2$  or  $\text{NC-CH=CH-OR}$  to  $\text{NC-CH}_2\text{-COOR}$  via CAA. None of such oxidations correspond to applicants' oxidation of  $-\text{CH}_2\text{OR}$  to  $-\text{COOR}$ .

Also, applicants' starting material is a saturated compound, not an unsaturated compound. Bulls et al. has to start with unsaturated  $\text{NC-CH=CH-OR}$  to obtain  $\text{NC-CH}_2\text{-COOR}$  via CAA - this does not correlate to applicants' process.

All of the disclosure and examples of Bulls et al. that use CADA are not pertinent because CADA contains  $-\text{CH}_2(\text{OR})_2$ . Furthermore, on page 4, Bulls et al. states that CADA is oxidized to CAA that has to be esterified to obtain ECA. This disclosure in Bulls et al. shows that the formulae on page 5 require esterification of intermediate CAA to achieve  $-\text{COOR}$ .

CACA is ethylene glycol CADA [CADA has  $-\text{CH(OR)}_2$ ], that is, the cyclic acetal of cyanoacetaldehyde derived from ethylene glycol (see Examples 19 and page 20, lines 3 to 5). Applicants do not start with any compound having a  $-\text{CH}_2(\text{OR})_2$  group.

Example 29, cited by the Examiner, deals with oxidation of CADA. It says that cyclic acetals have better selectivity than noncyclic acetals. Its reference to CACA is but a reference to a cyclic acetal of CADA and as such is not relevant.

As shown by Bulls et al.'s statement of its process CACA is oxidized to CAA, that is then esterified.

The Office Action stated see Example 25 wherein oxygen and  $(\text{Na})_2\text{PdCl}_4/\text{CuCl}_2$  catalysts are employed. Example 25 is not relevant as it oxidizes CAH to CAA, that is not an ester.

The Office Action stated: that, additionally, most of the claims of the instant process are drawn to the use of cobalt derivatives whereas the reference discloses the use of copper or palladium derivatives; that Claim 7 is a generic claim (lead based catalyst or transition metal catalysts); and that Claims 8 to 10 and 13 are drawn to the use of cobalt derivatives as already pointed out. Applicants have shown above that the use of cobalt and other transition metals as catalysts is unobvious.

The Office Action stated that none of the reference catalysts teach the use of cobalt or cobalt derivatives, however, it would be obvious to use cobalt derivatives because many transition metals are noted for forming numerous complex ions, as well as possessing extremely valuable properties in the metallic state. This statement is mere speculation. For example, what are such extremely valuable properties? Silence is no substitute for facts. Different processes are involved and applicants have shown above that Bulls et al. directs away from the use of cobalt catalysts.

The Office Action stated that Claims 11 and 15 require process temperatures of between 50 to 250°C; and that Example 33, page 25, discloses

temperature range which embraces that limitation. Example 33 does not produce an ester so it is not relevant.

The Office Action stated: that Claims 12 and 16 are drawn to the process wherein the oxidation is carried out in an organic solvent; that Bulls et al. discloses solvents such as methanol that can be employed in the process; and see page 6, line 19. Bulls et al. oxidizes  $\text{-CH}_2\text{OR}$  to CAA and then esterifies to  $\text{-COOR}$  so its oxidation step and its esterification step are not relevant.

Under the heading “Finding of prima facie obviousness---rational and motivation (M.P.E.P. §2142-2143)”, the Office Action stated that, accordingly, one of ordinary skill in the art would thus have been motivated to prepare cyanoacetic acid esters by the use of an analogous reactant in the presence of transition metal catalysts and manipulating process parameters such as temperature's, solvents with the expectation of improving product yield and purity absent a showing of unexpected results. Applicants traverse this statement for the above reasons. There is nothing in Bulls et al. that teaches or suggests that the CAA intermediate product of Bulls et al. is in ester form. The two-step process of Bulls et al. shows that applicants' one-step process is obvious.

The Office Action stated that the process that is being claimed is a predictable and expected process because it is known that transition metals in general possess valuable properties. Applicants traverse this statement. Catalytic activity is unpredictable so applicants' catalytic process is unpredictable.

The Office Action stated that the instantly claimed process would therefore have been suggested to one of ordinary skill absent a showing of unexpected properties and/or results. Applicants traverse this statement. The Examiner did not follow the dictates of the Graham decision as required by Patent Office policy. There is no factual determination in the record of the level of skill of one ordinarily skilled in the pertinent art. This means that this obviousness rejection is defective and fails on that ground alone with the consequence that there is no prima facie showing of obviousness in the record. The other many reasons set out above also show that applicants' claimed one-step process is unobvious. The Examiner has not carried his burden of proof.

This rejection should be withdrawn.

Reconsideration, reexamination and allowance of the claims are requested.

Respectfully submitted,

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Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

New Claim 17 has been inserted.